Annals of Clinical and Analytical Medicine
*Case Report*

# Persistent falcine sinus with hypoplastic distal superior sagittal sinus and aplasia of transverse sinus



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**Abstract**
Falcine sinus, located in falx cerebri, is a rare anatomical structure that closes after birth. A 40-year-old man was admitted to the hospital complaining about an intermittent headache and epileptic seizure that developed over the past 1 year. It was seen that persistent falcine sinus is related to hypoplasia of the posterior third of the superior sagittal sinus. Small calibrated collateral vascular structures were noted at the supratentorial level, especially between the right sulci and the interhemispheric fissure. The right transverse sinus was not observed. In this case report, a very rare combination of the persistent falcine sinus with dural sinus and gray matter anomalies was presented with literature and imaging findings.

**Keywords**
Persistent Falcine Sinus, Superior Sagittal Sinus, Straight Sinus, Embryology

DOI: 10.4328/ACAM.21368 Received: 2022-08-23 Accepted: 2022-09-25 Published Online: 2022-10-11 Printed: 2022-10-20 Ann Clin Anal Med 2022;13(Suppl. 2):S152-154
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## Introduction

Falcine sinus, located between the dural sheaths of the falx cerebri in the embryonic period, is a normal anatomic venous structure and closes after birth [1]. Falcine sinus that does not close after birth is defined as persistent falcine sinus (PFS). It is not uncommon in the literature, however its association with complex anomalies is extremely rare [2]. PFS has been reported quite commonly in pediatric patients [3]. However, it is a rare vascular anomaly in adults [1,4]. Different studies have reported that PFS is mostly localized in the posterior falx cerebri, and it may be related to obstruction of the straight sinus (SS) or superior sagittal sinus (SSS). It can be seen with congenital vascular lesions such as Galen vein malformation, arteriovenous malformations, corpus callosum agenesis, acrocephalosyndactyly, and Chiari malformation [3]. Here, we present a rare case with hypoplastic distal SSS and right transverse sinus aplasia accompanying PFS in an adult.

## Case Report

A 40-year-old man was admitted to the hospital complaining with an intermittent headache, clouding of consciousness, and epileptic seizures that developed over the past 1 year.

Cranial magnetic resonance imaging (MRI) (1.5-T Siemens Aera) (axial T1 weighted, axial and coronal T2 weighted, axial and sagittal FLAIR, DWI sequences) and magnetic resonance venography (MRV) (raw images obtained in the transverse plane with the contrast-enhanced 3D phase-contrast imaging method were processed by the MIP method) was revealed.

In Cranial MRI, encephalomalacia area in the right frontal lobe with hemosiderin pigments and dilatation of frontal horn of the right lateral ventricle was observed. (Figure 1a, b). The thickening of the meningeal structures in the right cerebral hemisphere, especially in the frontal region, was observed. In the right frontal lobe and superior temporal gyrus, an appearance compatible with pachygyria-polymicrogyria was detected (Figure 1c). In MRV SSS calibration is distinctly thin posteriorly and looks hypoplastic (Figure 2a). It was observed that the PFS extending from the middle part of the SSS towards the inferior continued as an SS-like vein and drained into the left transverse sinus (Figure 2b). Bilateral internal cerebral veins and basal vein of Rosenthal drained into PFS. Inferior sagittal sinus was not observed. Small calibrated collateral vascular structures were noted at the supratentorial level, especially between the right sulci and the interhemispheric fissure (Figure 3). Right transverse sinus and left Labbe vein were not seen. As a result of the findings, clinical and radiological follow-up was recommended to the patient.

## Discussion

Falcine sinus (FS), located between the dural sheaths of the falx cerebri in the embryonic period, is a normal anatomic venous structure [4]. Falcine sinus that does not close after birth is defined as persistent, reopening of closed FS secondary to pressure in venous sinuses is also defined as recanalization [2]. In fetal life, between the cerebral hemispheres, the dorsal venous channels of the anastomotic venous structure called the sagittal plexus, located at the level of the primitive falx cerebri, turn into the anterior part of superior sagittal sinus, and the

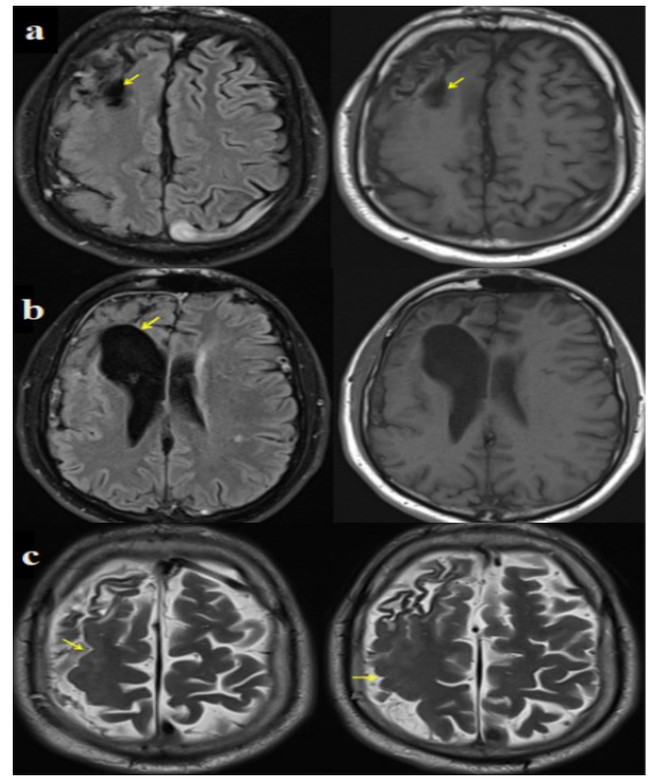


**Figure 1.** a. Encephalomalacia area in the right frontal lobe with hemosiderin pigments b. dilatation of frontal horn of the right lateral ventricle c. pachygyria-polymicrogyria was detected in the right frontal lobe and superior temporal gyrus.

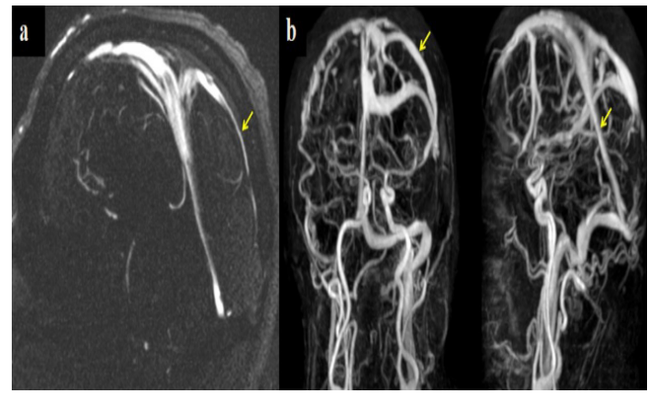


**Figure 2.** a. Hypoplasia of the posterior third of superior sagittal sinus b. PFS extending from the anterior part of the SSS towards the inferior and drained into the straight sinus.

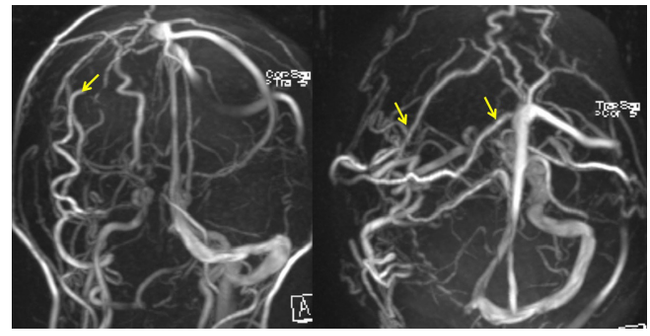

**Figure 3.** Small calibrated collateral vascular structures were noted at the supratentorial level, between the right sulci and the interhemispheric fissure.

ventral section turns into the straight sinus and inferior sagittal sinus [1, 2]. With the development of the occipital lobe, the SSS and SS enlarge towards the occipital pole, allowing the SSS and SS to be fully formed. Falcine sinus is formed by one of the caudal anastomotic canals of the sagittal plexus and usually disappears after complete development of the SSS and SS [5].

The incidence of FS, PFS, recanalized FS is %5.3, %3.7 and %1.6, respectively, in a study on 1531 cases with thin-section contrast-enhanced 3D sagittal T1 scans, and MR venography showing that FS is not rare. According to this study, only three of the 57 PFS patients had complex congenital anomalies, two had rudimentary SS, and fifty-two patients had no anomaly accompanying PFS. Anomalies of straight sinus and SSS are usually associated with FS as a result of their embryonic relationships during the fetal period [2]. These anomalies usually include hypoplasia or absence of venous sinuses and the incidence is very low [2]. Aplasia or hypoplasia in the straight sinus can lead to an alternative venous pathway through the sagittal plexus to direct blood from the deep venous system to the superficial system [3]. Falcine sinus acts as an alternative pathway [4].

In one of the 3 cases with SS aplasia and reported to have PFS at different times before, there was atretic encephalocele and anterior cerebellar vermis atrophy in one [6], atretic encephalocele in the second [7], and temporal arteriovenous malformation in the third case [8]. In all three cases, PFS developed as a congenital variation. Absence or interruption of the straight sinus caused the persistence of falcine sinus [6-8]. Hypoplasia of the posterior third of the SSS, such as SS aplasia, can also lead to the development of PFS [1]. In this case report, hypoplasia of the distal SSS caused FS to persist.

Many congenital anomalies associated with PFS have been described. These are bifid cranium, Galen vein malformation, corpus callosum agenesis, Apert syndrome, pericallosal arteriovenous malformation associated with the absence of the posterior part of the corpus callosum, osteogenesis imperfecta, Chiari type II malformation, occipital encephalocele, parietal skull defect, meningoencephalocele, absent or dysplastic tentorium cerebelli, midbrain arteriovenous malformation, and bilateral giant parietal foramina [3, 5, 6].

Increased pressure within the venous sinuses can lead to the recanalization of potential venous channels such as falcine sinuses. External causes of increased internal pressure of venous sinuses are tumor compression (especially those close to the meninges and closely related to the venous sinus), and pressure on the venous sinuses of thickened meninges due to hypertrophic meningitis. The internal cause is venous sinus thrombosis [2].

In the case presented here, there were hypoplastic distal SSS, aplasia of inferior sagittal and right transverse sinuses, small calibrated collateral venous vascular structures accompanying PFS. At the same time, an appearance compatible with pachygyria-polymicrogyria was observed in the right frontal lobe. This association supports that the presence of PFS in our case is congenital.

## *Conclusion*

Persistent falcine sinus is not a quite rare anatomic variation, it can be seen in different age groups, children, and as well as adults. It may not always be related to complex craniocerebral anomalies. However, when it occurs, it may be associated with congenital and acquired anomalies in the superior sagittal sinus or straight sinus. FS and accompanying anomalies will be better understood and diagnosis will be easier with the help of the high soft-tissue resolution of MRI.

***Scientific Responsibility Statement***

*The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.*

***Animal and human rights statement***

*All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.*

***Conflict of interest***

*None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.*

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***How to cite this article:***

***Hatice Kaplanoğlu, Aynur Turan, Ferhat Yıldırım, Veysel Kaplanoğlu.*** *Persistent falcine sinus with hypoplastic distal superior sagittal sinus and aplasia of transverse sinus. Ann Clin Anal Med 2022;13(Suppl. 2):S152-154*